AMANDA Antarctic Muon And Neutrino Detector Array

Physics Goals

Measures muon tracks generated by neutrinos (upward going, signal) or cosmic rays (downward going, background) and neutrino induced cascade reactions. Aims to discover 1. galactic and extragalactic point sources of neutrinos from, e.g., Active Glactic Nuclei, Gamma Ray Bursters, Supernovae Remnants; 2. a diffuse flux of H.E. neutrinos from all possible sources, including GZK resonance. Map the neutrino sky in a completely uncharted region. Also searches for neutrinos from WIMP annihilation in Earth and Sun, monopoles.

Features

Water (Ice) Cherenkov detector located in Antarctic ice sheet at S. Pole. 608 PMT's deployed at depths from 1500 m to 2400 m on 19 strings. Instrumented volume about 0.05 km^3. Pointing accuracy for muons about 4 deg. Energy resolution about +/- 0.4 in $\log_{10}E$. Ice has long absorption length but short scattering length. Dust layers complicate analysis.

Technological Challenges

AMANDA has solved the "deployment problem," encountered by large-volume cherenkov detectors. Constant techology developments with successive string deployments have resulted in an inhomogeneous readout system, which complicates the analysis. Data transfer from S. Pole is a challenge because of limited satellite coverage.

LBNL Contribution and Interest

LBNL has built one of the strings, deploying a new digital technology that is the prototype for IceCube. LBNL has archived, stored and processed the data from AMANDA until this year. UCB (Buford Price's group) is also a member of AMANDA.

Status

AMANDA is taking data, and undergoing technical improvements (adding waveform recording).

Timeline

AMANDA will operate until it is subsumed by IceCube (FY '05)

Location

Amundsen-Scott Station, South Pole

Collaboration

U. Wisconsin, U. Irvine, Penn State, UCB, LBNL, DESY (Zeuthen), U. Stockholm and Uppsala, U. Mainz

Funding Sources

NSF (MPS and Office of Polar Programs) European funding agencies.

Resources, Links, and References

http://amanda.berkeley.edu/amanda/amanda.html
Letter to Nature http://area51.berkeley.edu/manuscripts/20010503xx-amanda_nature.pdf

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